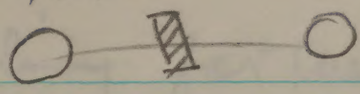
NOTES ON SCREWWORM MEETING, Dec. 11, 1979, La Quinta MOTEL, McALLEN, TEXAS

Spencer -

Sinaloa test - DE-9 strain



- 81 egg masses from 5 sheep pens
- now 7 pens
- 89 of 90 egg masses were fertile
- Dec 1 - 1 sterile egg mass
- 20 nov - 1st release of sterile flies
- Dec 1 - 10 - 25 additional egg masses
- 3 unhatched -
- 16 sterile, 6 fertile
- 2000/sq. mi - over 1500 sq. mile area
- larval samples for enzyme study -
- pupae to mission for new strains -

? how much immigration into the test area?
Knipling - we must assume that migration in and out is an important factor -
- 50% sterility under these conditions is significant.

? migration from cool areas to warm areas may be a trend at this time of the year?

Coppedge - Addana differs from Sinaloa in many ways -

D@9 strain - chilling, shipping problems - change to Aricruz - quickly 5 to 50% sterility -

increase in release rate, + river drops, 50% increased to 60% sterility -

Commission policy for the operation of its inspectors changed —
integration of control measures —
K: I agree, sterile fly release must be supplemented with other control measures. However, I am still concerned with high ratios of released to wild flies —
Data from SWASS release were inadequate —

Rawlins —
males only strain —
10 to 15 generations to obtain 24X resistance —
heat stress —
insecticide stress —
to obtain a conditional lethal
heat stress the eggs — 41°C gives about 50% mortality
? 42.5% ? — about 90% mortality
DC6, an Alabama strain, about 20x fold resistance to coumaphos —

Aricruz strain — possible 40% survival or ± 40X resistance —
heat stress has more promise as an approach —
exposure ~~of~~ to heat, about 1.5 hrs ~~mixed~~ after oviposition —

cont.

selection for resistance might proceed faster if single egg masses were used —

Knipling — remarks on resistance to DDT in house flies — probably total immunity in about 12 generations — single gene — multigene would be slower —

Coppedge —

when to use SWASS ?

1. in areas when have been screw-worm-free ?

more than one case or wild fly per 2000 km^2 per case is justification

Knip — whether or not sterile flies have been released in the area would be a factor —

Novey — how good as the reporting from the area in question ? I would want more data, perhaps from SCORM — lure baited traps — first step would be sterile fly release —

Knip — how many traps & how much to area ?

Coppedge — 15 to 20 traps per 500 to 1000 sq miles —

Smoot — do you use SWASS propylactically ?

Knip — two sets of guide —

lines are needed — one for a release area & one ~~for~~ outside a release area — you need to avoid a Texarkana type outbreak — by the time the first case is reported you may be in the 2nd or 3rd generation — perhaps it would be worthwhile to use SWASS 10 times even though it was actually needed only once —

Novey — does use of SWASS counter-indicate use of traps?

from my experience I like to start sterile fly release immediately and put in traps soon to check fly release as well as

Vargas — not all areas are at equal risk — epidemiological data could be compiled in advance to characterize the susceptibility of an area to outbreaks —

Coppedge — would SWASS ~~be~~ automatically be used as soon as you have a second case or a second wild fly? general agreement that yes you would —

Novey — when would you not use SWASS ?

general discussion of waterways — effect on shrump, turtles etc —

Vargas — in one week bioassays of SWASS will be completed — cat fish, bass, shrump, oysters, mosquitoes, belostomids etc.

Lloyd W. — so what do we do?

#

Jim Mackley — we need a small committee to settle this —

#

Coppedge — what about an area like Arizona — ? 3 to 5 cases (or trapped flies) per 2000 km² per week —

3rd situation — example, Aldama — not a screwworm-free area — but near the barrier zone, at times in the barrier zone —

4th situation — a problem area deep in Mexico —

Reichart — barrancas de Chihuahua, a variation of category 3 —

Norby — how many applications is the maximum no (of SWASS)?

DelVarP – situation 4 – a research problem –
Knip – perhaps you need a conference, you might then find that a 3 to 4 week release by SWASS is justified but only after safety and other factors have been evaluated in a timely ~~situation~~ fashion –

Coppedge – a new type of SWASS – a feeding station – better than pellets, about 10% better than WO trap – at 5–10 (?) per sq mi you can remove 90 to 95% of the wild flies –

Reichard – applicable in the bananeas –

Knip – this coved be used near water ways where the pellets cannot –

Brown – remaining chemical problems – cold storage – good for 6 weeks at 2°C DDVP is lost at ~~the~~ about the same rate as the SWORMLURE –

Knip – at what point is the pellet not effective

APHIS contract – toxicity of the components of SWORMLURE – not yet complete

Tuxtla research -

Machley -

SWORMLURE - poor performance in Chiapas - why ?

Machley will do trapping studies - wet vs. dry season - ~~Jan~~ July vs January -

flower attractants -

need to characterize the physiological state of the flies when respond to different categories of attractants -

blow flies - pollen collectors - they feed on nectar and accidentally collect pollen -

large cages for rearing field hardy flies - influence on the hydrocarbon component ?

a quality control tool ?

++

trap line to San Cristobal - high country - 440 to 2200 meters altitude -

economic impact of screwworm in the Isthmus - Spencer ?

Martinez —

trucks shipment of flies, Guadalajara to Hermosillo — 6 shipments —

what caused damage the ~~d~~ pupae in the trucks? —

packaging problems —

the road was very rough, the partitions in the box injured the pupae — emerged flies were less susceptible than pupae — leaving partitions ~~and~~ out of the boxes did not improve quality —

back of trucks was rougher but the difference was only about 1% —

rough springs — 82-83% emergence, air suspension — 96-97% emergence —

in ~~one~~ 5 of 6 shipments, truck shipment was better than plane —

Knipling — sifting to eliminate houseflies,

Hofmann — about 4% loss of pupae — when house flies are controlled, sifting will stop —

Knipling — Heliothis pupae are easily injured, perhaps early pupal period of screwworm is very sensitive to mechanical injury —

(8)

Martinez

barrancas - 500 to 570 meters _ 225 sterile flies to one wild fly -

1320 to 1800 meters -

10 nov to 5 dec

alt. (m)	♀s	♂s	WF
500 - 570 m	964	244	5
1320 - 1510 m	110	22	0
1720 m	28	7	0

conclusion: released flies do reach the bottom of the canyons -

Emergence at Tuxtla dropped to 94% (from 97-98%), probably because of temperature control problems in ~~Tuxtla~~ holding rooms -

Knip - how about egg production?

Martinez — male : female ratio changed, ~~became~~ fewer females dropped from 52:48 to 53:47 or 54:46 —

Snow — egg production — ?
Hofmann — continues to be a problem —
Knip — how about at mission, hasn't this been a problem for a long time? biorhythm? similar to diapause regulating mechanisms? a seasonal cyclic instinct?

Hofmann — we do not have a consistently reliable oviposition attractant —
Knip — Fargo?
LaChance — we do have a problem that could be seasonal —

Hofmann — SEA left Aldama in Sept, since we trapped 9 wild flies — in November — from 15 traps — only 1-2 (4?) cases in November

the SEA agility test developed by Woodward —

Ellison & Gagné —

screwworm morphology

Whitton — lab crosses —

lines —

C1 —	2 egg masses	sheep		F8
D8 —	1 " "	"		
AC1 —	1 " "	cattle		F8
AC4 —	1 " "	"		F6
AC7 —	1 " "	"		
MZ —	?	(Sonora)	=	

one ♂ X 2 ♀♀ (to lessen the effect of harassment)

reciprocal crosses,
F1 adults back-crossed both ways
pupal weights recorded —
% emergence
sex ratios —

percent mating and percent hatch were lower in the 1st crosses than in the "pure" strains And than in the back-crosses —

Sinaloa — 46 cultures now in the lab came recently from Sinaloa

Knip — dangers of in-breeding ? =

Beal — the amount of inbreeding in Whittons tests may not exceed the amount which occurs in nature — when cousins mate the inbreeding effect is reduced as compared to full sib mating —

Richardson = loss of cultures may be due to inbreeding, too much adaptation, or loss of critical numbers.

Mc Innis —

paint markers —
sex separation at 2 days —
009 were mating at 2 days —
sex separation now at 1 day —
effect of space

McInnis —
chilled flies — greater mating frequency than in unchilled flies —

Averhoff — Arriaga test
sheep pen collections
also livestock collections
about 200 collections (eggs + larvae + wild ♀♀ which were egged)

Knip — what is the plan
AV — the most prevalent strain will be colonized + released to see if it more selectively controls its own kind —
will the relative proportions of "Strain A" to "Strain B" (+C +D + etc?) change after strain A has been released

Averhoff — fly behavior in a large room —
heat, humidity + light gradients to influence fly movement —
in answer to question — no room for 2 test areas

Knip —
least prevalent type vs. most prevalent (genotype) —

La Chance –
Hamrick – oviposition stimulants –

009 & Arizona strains responded equally to concen. of citrated blood –

bacteria – from wounds + from vats – one from larval salivary glands
Proteus ?

=

George Pomonis – cuticular hydrocarbons – from various strains –
use mass spectrophotometer
what is a short range mating attractant
there is a change with age –
diet does not have much effect –
radiation has very little or no effect
there are differences in strains –

=

Whitten + McDonald are cooperating

Tannahill – survey –
SEA – APHIS – TAHC cooperation
survey in 7 (?) border counties –
also a quality control tool –
influence of wicks – plastic may not be good in cool weather

use of TAHC personnel is very helpful -

trapping in an eradicated area -
Knip - is trapping a more sensitive tool
than case reports -
Tannahill - yes -

Knipling - 3:21 PM - Dec. 12, 1979

Spencer - DE9 strains at Sinaloa

25 egg masses - 72% sterile

to determine if a strain from the East Coast can be used successfully on the West Coast

---

SWASS - has been successful

bait station - looks very good

a high percentage of the local population do visit such a station: at the rate of 3 or 4 per sq. mile they might be useful + very practical, especially in canyons and near rivers where pellets cannot be dropped.

criteria for use of SWASS

above the barrier: a single case would not justify the use of SWASS; instead fly drop plus trapping then survey

a second case would justify use of SWASS

in an active release area: 3 to 5 cases

Vargas - environmental studies

Rawlins - males only, progress to date a money-saving possibility; also males only in an area might increase efficiency

chemical sterile, physical sterile

Dr. Knipling's remarks at mission; a resumé of the meeting held in McAllen on Dec. 11, 1979.

Dr. Hedgling remarks at meeting held in MIS cellar on Dec. 11, 1979.

Knipling — p. 2

Mackley — southern Mexico, behavior, ecology, contact pheromones, cuticular hydrocarbons

Martinez — shipment stresses —

Vargas & Martinez — distrib. of sterile flies in canyons at different elevations

at 3 different heights —

an encouraging finding —

Aldama — producer cooperation

VT Researchers —

why do we have to release at ratios of 100 to 1 or 200 to 1 or higher —

Obviously our best fly is not highly competitive —

reproduction isolation is what the VT group offer as an explanation —

There seem to be differences which have not yet been fully evaluated —

Isagné — morphological studies

VT group feels that they can recognize strains by morphological structures

Whitton —

McInnis — assortative mating?

perhaps. some distinct incompatibilities were seen

Knipling - p. 3

arriaga - now developing base line data - careful planning will be needed -

La Chance - wound attractants,

other attractants -

SWORMLURE - extremely important a program tool + a research tool

bacteria - one species produces a material which is highly attractive -

Tamashiro - traps, other survey operations

Woodard - see handout

group discussion: use of several strains; facilities should be available to maintain several strains in "pure" form -

12-12-79

SAT COMPARISON OF TWO METHODS OF PUPAL TRANSPORT

Donald B. Woodard and John Turner

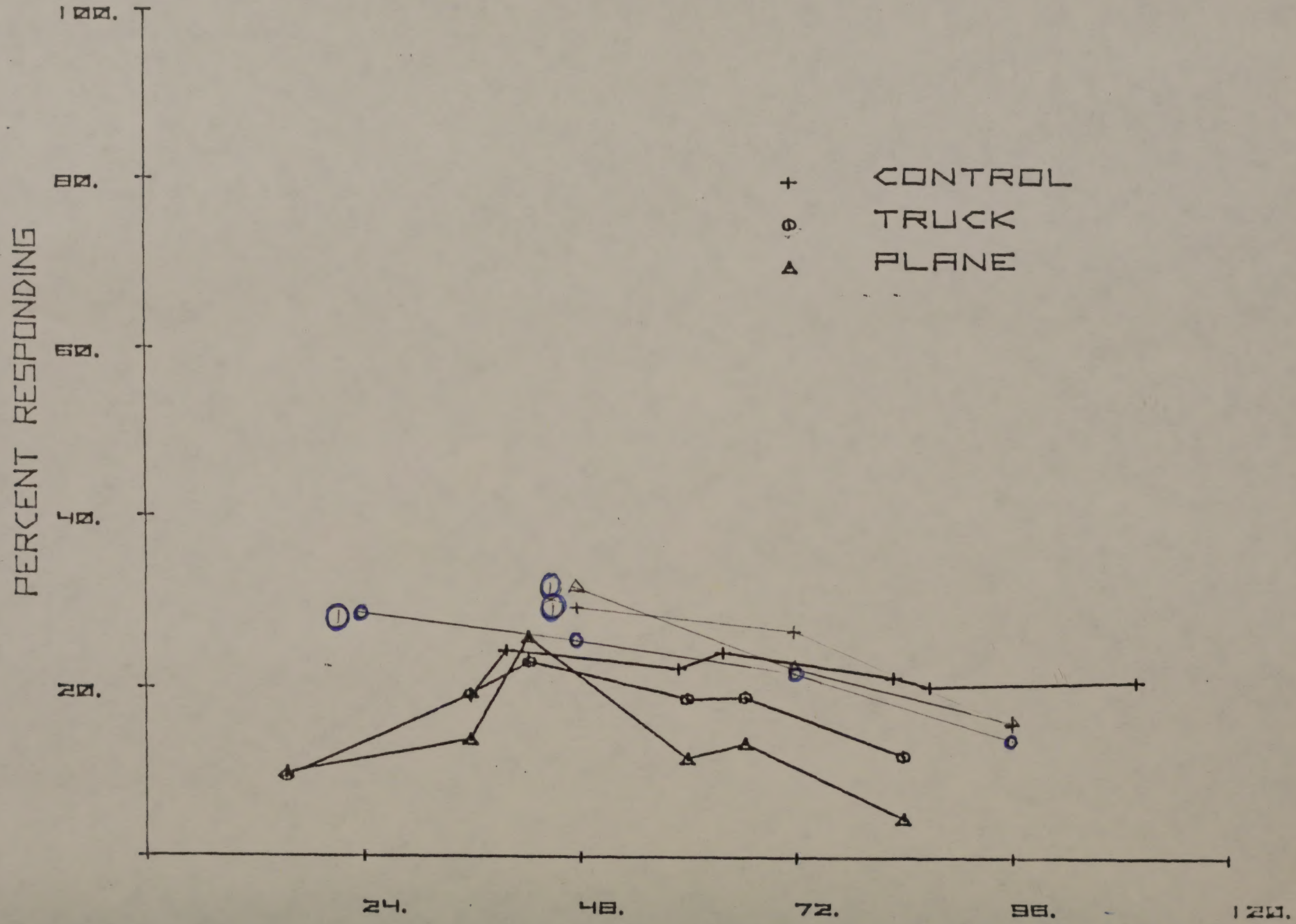
The transport of Aricruz strain screwworm pupae from Tuxtla Gutierrez, Chiapas, Mexico to dispersal facilities at Mission, Texas and Hermosillo, Sonora, Mexico by refrigerated truck and by DC-6 aircraft, and a combination were evaluated by Methods Quality Control and by a new method, here named the "Standard Agility Test"(SAT). This method is a modification of a previously used routine quality control test, and differs in that it is done under controlled conditions, and is therefore replicable.

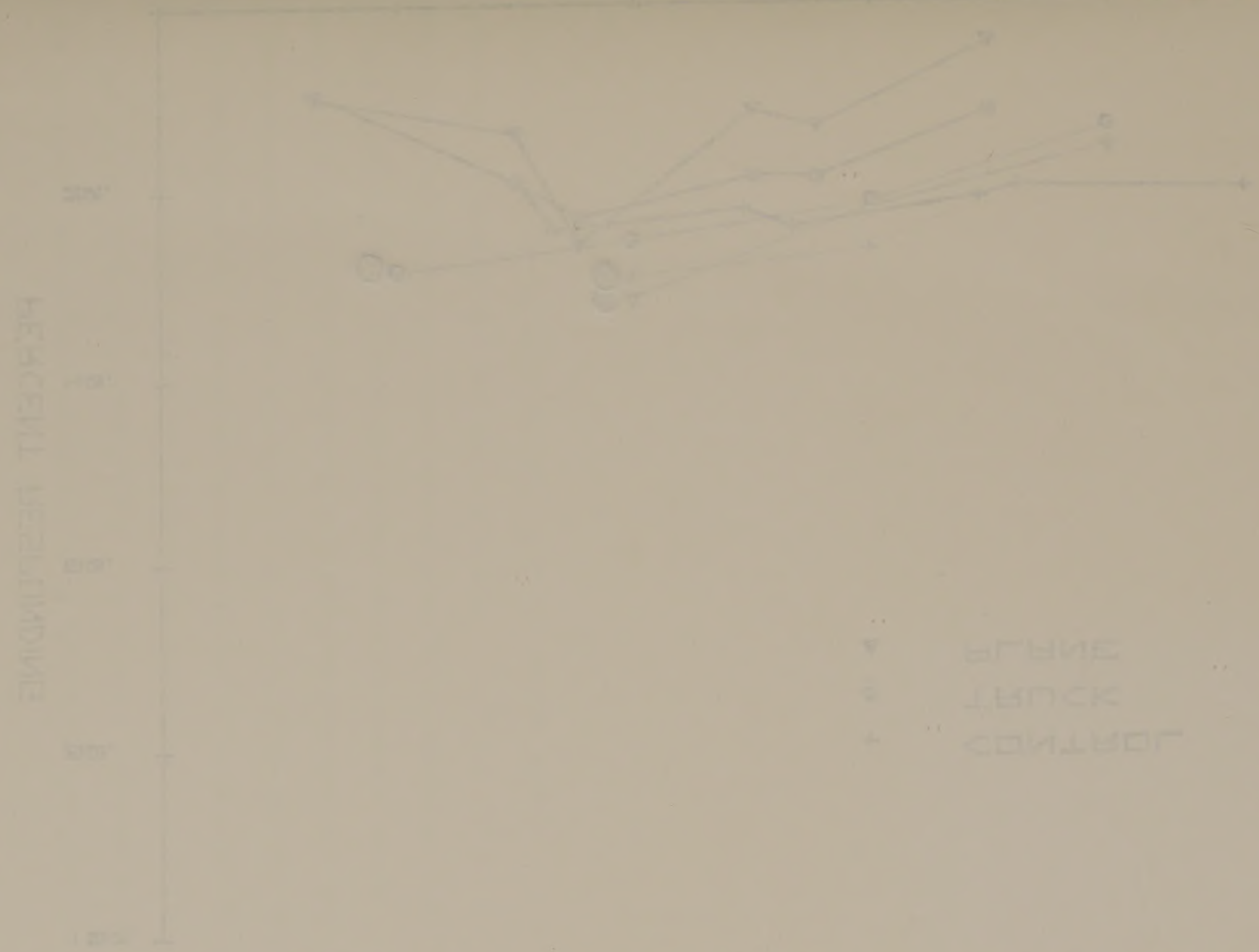
The first shipments from which samples were studied using the new standard agility test procedures to evaluate possible quality changes in the "Aricruz" strain of flies produced both at Tuxtla and Mission were made during the months of June and July, 1979. In these studies samples of pupae produced at the Tuxtla facility were split, and part sent via specially equipped refrigerated truck to Mission, Tx. The other part was sent via the DC-6 aircraft to Mission, Tx. The control groups were drawn from regular production pupae produced at the Mission facility. Travel times were approximately 7 hrs via air and 48 hrs via truck. The later studies made in October, 1979 utilized a combination of transport methods from Tuxtla to Hermosillo. Both types studied included shipping bulk packaged pupae in the special refrigerated truck to a center located in Guadalajara. This travel averaged 38 hrs. The samples of pupae were then separated. One part was sent to Hermosillo via DC-6 aircraft, travel time approximately 3 hrs; the other part was packaged in the large program release flyboxes with food ready for aircraft dispersion. These boxes were loaded into racks which were sent via refrigerated truck to Hermosillo. This travel took

an average of 24 hrs. The temperature was set at 78° F to allow the flies to start emerging during the final transport phase. All controls for these groups were taken from the test pupae before they were loaded for shipment at Tuxtla.

The SAT results for both studies are presented in Fig. 1. Comparison of results from non-transported flies (control) run in the SAT units indicate very little difference in the Aricruz strain reared at Tuxtla and at Mission. The groups tested after transport do show some changes, and the response of the flies decreased slightly after the longer transport trips to Hermosillo. The levels noted were in no case very far from the control curves, and indicated that any of the methods tested could be utilized in the control program.

Figure 1. S.A.T. response of Aricruz strain screwworm flies. Control group tested at Tuxtla Gutierrez; Truck and plane groups tested at Hermosillo, Mexico. First test series: Tuxtla to Mission. (1)





Mission, Texas, Dec. 12, 1979

1. UT Cooperation — ⬡ —
2. ABC strain development —
3. Genetic research —
4. Egg production — adult research — (physiological problems)
5. Field behavior —
6. attractants — natural synthetic chemical
7. population dynamics in the tropics & hosts, weather, natural enemies
8. strain evaluation —
9.
10. IPC programs for screwworm suppression control (and ticks control?)

Conference with Spencer, Mackley and Whitten concerning 1980 research at Tuxtla

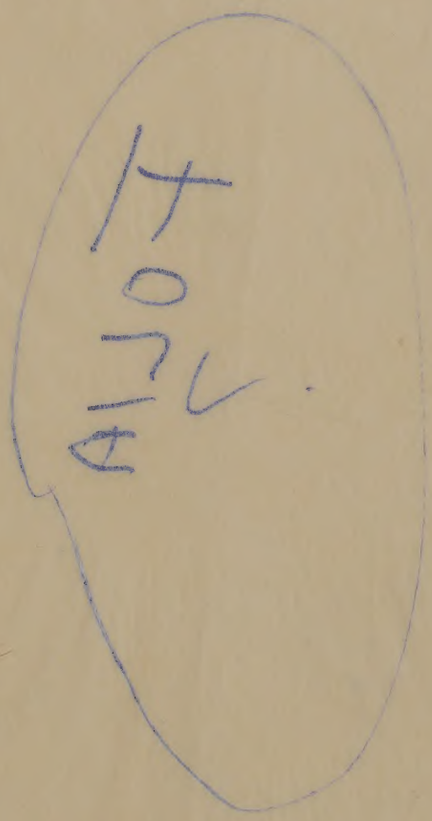
1. UT Corporation
2. ABC Atomic Development
3. Atomic research
4. Egg production — rabbit research
(physiological problems)
5. Field laboratories
6. Patterson — Natural chemical
synthetic
7. Physiology department in the Tropics
Texas, Austin, Natural environment
8. Atomic production
9. [illegible]
10. IPC programs for [illegible]
(and Texas control?)
supervisors

Conference with Agnew, Moseley
and Whitten concerning 1980 research
at Trinity

Tuxtla – Facilities –

(1) club building —
(2) mobile home —
cabinet space
cages, cage racks
larval rearing – none at present
(3) – AA at Tuxtla ? bilingual secretary ?
(4) – vehicles for Tuxtla –

(5) Field Party advance



for Tuxtla – ?

Bryant M. Cawley Jr.
Bellsville

Dr. P. J. Scholl
Lincoln, Nebr.

AGRICULTURAL RESEARCH SERVICE
SOUTHERN REGION

OF UNITED STATES DEPARTMENT OF AGRICULTURE

U.S. LIVESTOCK INSECTS LABORATORY
P.O. BOX 232
KERRVILLE, TEXAS 78028

Jan 11, 1980

Tape 1 Side 1 → Robstown conference — proposed program for 1980 —
Richardson survey data —
we now have a general idea of diversity of screwworm types —

species release — an uncommon type fills a niche after a common type has been removed —

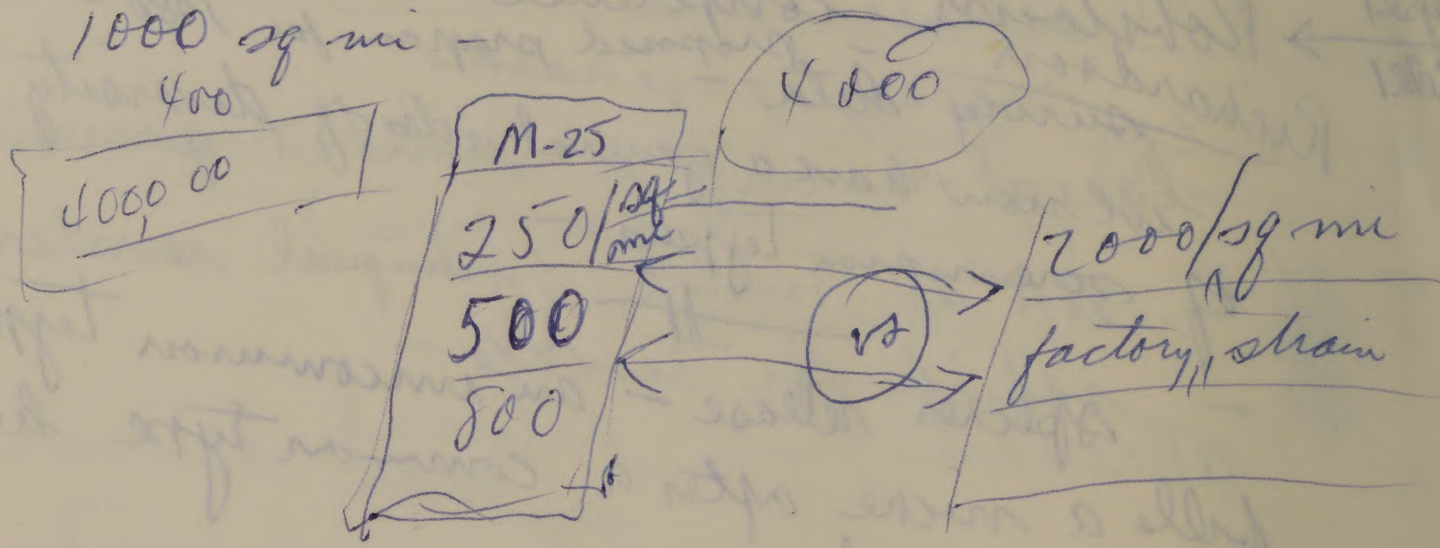
Dr. Rios — formerly Area Epidemiologist, Area V (Arriaga)

DuBR — morphological features needed to added to bar type + isoenzyme data —

start release at a low level —
coppedge; pre-release studies?
" ; how big an area
? Control area — need 20% of the samples from the control area —

2) Tape 2 side 1 – lunch breaks at #160
2:25 PM – start Tape 3 – side 1

Why M-25 – ? ⟷ MR-14



Tape 3 – side 2 – 3:20 PM –

Arriaga Genetics Experiments

January 11, 1980

The following genetics experiments will elucidate at least some of the genetic parameters of population isolation existing in Arriaga. Examination of the karyotypes of collections from Arriaga indicate that there are at least 5 different types. More may be found with further analysis. The purposes for these tests are 1). To document any chromosome aberrations that may serve as isolating mechanisms. 2). To detect any isolating mechanisms that may be so severe as to be demonstrable under laboratory conditions. 3). Search for field identifiable morphological differences that correlate with the observed genetic differences. The following experimental procedures and experiments were designed with these purposes in mind:

1. Crosses will be made between each identified type and other identified types. If the mating is successful, F-1 hybrid larvae will be used for karyotypic analysis, and F-1 adults mated and tested for fertility. F-1 males will also be used for genitalia and chromosome analysis.

2. The F-1 hybrid males from the above experiment will be examined for meiotic chromosome configuration. Such analysis will reveal gross chromosome aberrations such as inversions and translocations.

3. The F-1 larval neuroblast preparations will be used largely to "fine tune" the chromosome measurements made on pure cultures, and relate them to one another. Accurate comparisons between chromosome types are most easily made in a hybrid.

4. Genitalia preparations and "type specimens" of each type will be preserved in pinned collections as museum records. Male terminalia from F-1 hybrids are necessary to recognize any hybrid types found in the field. It is desired that genitalia preparations become a routine method of identification of screwworm type. Contributions to this work are expected from Dr. Gagne.

5. The F-1 hybrid adults will be crossed and tested for fertility. If the F-1 hybrids are fertile, egg hatchability will be determined to detect any lethality from such factors as translocations, synthetic lethals, inversions etc.

6. Using both karyotype and isozyme information, the progress of the field test will be monitored. Hopefully the morphological experiments will be far enough advanced that further confirmation of effect can be obtained using these techniques.

Arriaga Field Test

January 11, 1980

Although we have touched on many facets of the field test in earlier discussions, we are now in a position to begin to examine some specific details. Some of the considerations include the following points:

1. Diversity of types seems somewhat greater in the south than in the north of Mexico, even though both areas do not freeze.

2. Detection of changes in frequency of a type are easiest if it is common in an area. This typically is also the economically most damaging (so far these are "r-types" with high fertility, they are relatively non-discriminating, and have widespread ranges)

3. Irreversible disturbance to an area is most unlikely if the type(s) eliminated are found elsewhere, so natural reintroduction would be expected.

4. Mating effectiveness can be most easily determined if the elimination occurs with minimal complications by nonuniform distribution of sterile flies.

5. If some types can be eliminated and others left, "species release" can be examined by continuing to monitor the area after sterile flies are no longer released.

6. If a systematic increase in density of sterile flies is followed in the event of differential sensitivity of types to the released type, effectiveness of any isolating mechanisms may be evaluated. (This possibility and that in item 5. are mutually exclusive for simultaneous execution in one area. This is related to item 7, below.)

7. If types eliminated can be re-introduced from factory cultures, a series of experiments can be performed to evaluate effectiveness of different types of sterile flies, or different densities, but the re-introduced types should have a reasonable sample of the original gene pool. (Consider the problems of political and biological consequences!)

8. It would be essential to maintain absolutely pure cultures regardless of the type experiments being performed, or whether they were used eventually for producing sterile flies or re-introduced populations.

Arriaga Field Test

January 11, 1980

Although we have touched on many facets of the field tests in earlier discussions, we are now in a position to begin to examine some specific details. Some of the considerations include the following points:

1. Diversity of types seems somewhat greater in the south than in the north of Mexico. even though both areas do not freeze.

2. Detection of changes in frequency of a type are easiest if it is common in an area. This typically is also the economically most damaging (so far these are "r-types" with high fertility; they are relatively non-discriminating, and have widespread ranges)

3. Irreversible disturbance to an area is most unlikely if the type(s) eliminated are found elsewhere, so natural reintroduction would be expected.

4. Mating effectiveness can be most easily determined if the elimination occurs with minimal complications by nonuniform distribution of sterile flies.

5. If some types can be eliminated and others left, "species release" can be examined by continuing to monitor the area after sterile flies are no longer released.

6. If a systematic increase in density of sterile flies is followed in the event of differential sensitivity of types to the released type, effectiveness of any isolating mechanisms may be evaluated. (This possibility and that in item 5. are mutually exclusive for simultaneous execution in one area. This is related to item 7. below.)

7. If types eliminated can be re-introduced from factory cultures, a series of experiments can be performed to evaluate effectiveness of different types of sterile flies, or different densities, but the re-introduced types should have a reasonable sample of the original gene pool. (Consider the problems of political and biological consequences!)

8. It would be essential to maintain absolutely pure cultures regardless of the type experiments being performed, or whether they were used eventually for producing sterile flies or re-introduced populations.

Behavior Tests at Tuxtla Guiterrez (Green Room)
Using Arriaga Types

January 11, 1980

Knowledge of screwworm fly behavior is depauperate, but not from a lack of interest. The opposite has long been true. Extreme difficulties have been encountered in studying the behavior of this unobtrusive fly whose normal population density is thought to rarely exceed 15-20 individuals per square mile.

In nature, studies have been hampered by the difficulty in locating the flies. Laboratory studies, particularily of mate selection, have had limited success because the flies exhibit only escape behavior when physically restrained by placing them in large cages. The flies will mate and oviposite when confined in small cages where normal flight is impossible or when kept in darkness in slightly larger cages. Both of these conditions probably eliminate, or limit, the functioning of natural isolating mechanisms.

Reports of observations in nature of wild screwworm behavior are rare. Observations reported of released flies in semi-natural circumstances are more common. These observations involved released flies in much higher densities than otherwise found in nature. Further observations of these types diligently pursued, expanded, and coupled with laboratory studies may help decipher wild screwworm activity patterns.

During the past year James Mackley, Bill Marshall and Wil Averhoff spent considerable time and effort observing wild screwworm flies. Almost all, perhaps all, of the observations in nature were of females. They also observed factory reared males in the area surrounding the Tuxtla factory. Many hours were spent discussing the literature, speculating on the meaning of what had been observed and how the observed behavior might fit into the whole activity pattern of screwworm flies. To date all observations indicate that the following elements are involved in screwworm fly mate location and selection.

1. Males establish operating bases on plants or other perching areas.

2. They sally forth and investigate any object that resembles a female flying within their operating area.

3. If the object is a female screwworm fly, the male pounces on her and attempts to subdue her.

4. If he is successful, they light on a suitable perch where mating occurs.

Behavior Tests at Textile Guterrez (Green Room)
Using Arrivage Types

January 11, 1990

Knowledge of screwworm fly behavior is depauperate, but not from a lack of interest. The opposite has long been true. Extreme difficulties have been encountered in studying the behavior of this unobtrusive fly whose normal population density is thought to rarely exceed 15-20 individuals per square mile.

In nature, studies have been hampered by the difficulty in locating the flies. Laboratory studies, particularly of mate selection, have had limited success because the flies exhibit only escape behavior when physically restrained by placing them in large cages. The flies will mate and oviposite when confined in small cages where normal flight is impossible or when kept in darkness in slightly larger cages. Both of these conditions probably eliminate, or limit, the functioning of natural isolating mechanisms.

Reports of observations in nature of wild screwworm behavior are rare. Observations reported of released flies in semi-natural circumstances are more common. These observations involved released flies in much higher densities than otherwise found in nature. Further observations of these types diligently pursued, expanded, and coupled with laboratory studies may help decipher wild screwworm activity patterns.

During the past year James Mackley, Bill Hernandi and Wil Averhoff spent considerable time and effort observing wild screwworm flies. Almost all, perhaps all, of the observations in nature were of females. They also observed factory reared males in the area surrounding the Textile factory. Many hours were spent discussing the literature, speculating on the meaning of what had been observed and how the observed behavior might fit into the whole activity pattern of screwworm flies. To date all observations indicate that the following elements are involved in screwworm fly mate location and selection.

1. Males establish operating bases on plants or other perching areas.

2. They sally forth and investigate any object that resembles a female flying within their operating area.

3. If the object is a female screwworm fly, the male pounces on her and attempts to subdue her.

4. If he is successful, they light on a suitable perch where mating occurs.

Although these four elements have been deduced or observed, they constitute less than a skeleton of the mating process. Some of the important missing components are:

1. How do males select operating bases?
   What are the temporal aspects of occupying an operating base?
   What are the temperature and humidity effects?
   Is the location correlated with oviposition sites?
   With feeding sites?
   With water?
   With wind direction and velocity?

2. Are visual cues alone involved or are auditory and/or olfactory elements utilized?

3. How is identification accomplished?
   Are there tactile components?
   Are there contact chemical components?
   Are size, weight and strength involved?

If we assume that screwworm flies evolved from blowflies, we can speculate on the behavioral changes that would be necessitated by the shift from a nonliving to a living larval substrate. Blowflies usually exhibit behavior that is extremely annoying to animals, but without disturbing their usual larval substrate. They noisely buzz about and mate on or in the vicinity of the substrate. A similar type of behavior would reduce the fitness of a fly whose substrate is a living animal. Screwworm flies seem to have evolved behavior patterns that reduce these disturbing aspects. (1) They do not mate on the larval substrate; in fact, mature males rarely, if ever, visit animals. (2) The females do not buzz or fly disturbingly around wounded animals, but appear to be very unobtrusive during their approach to a wounded animal and while investigating an oviposition site.

Female screwworm flies visit wounds apparently to feed and to oviposite. Three day old females and gravid females (6-8 days old) are the most frequent among females visiting wounds. Females reach sexual maturity and usually mate when three days old. Thus, it seems that there has been a shift in location for mating from the larval substrate (blowflies) to an area in the vicinity, perhaps a certain distance downwind, in the evolution of the screwworms This provides a clue as to the locations where males may establish operating bases and where matings might be observed.

In view of the above considerations, a design encompasing nonphysical constraints of the flies could lead to a more informative test for the mate preferences of the various genetic types of this organism. The experimental design proposed by Wil Averhoff (February 12, 1979) is being

Although these four elements have been deduced or observed, they constitute less than a skeleton of the mating process. Some of the important missing components are:

1. How do males select operating bases?
What are the temporal aspects of occupying an operating base?
What are the temperature and humidity effects?
Is the location correlated with oviposition sites?
With feeding sites?
With water?
With wind direction and velocity?

2. Are visual cues alone involved or are auditory and/or olfactory elements utilized?

3. How is identification accomplished?
Are there tactile components?
Are there contact chemical components?
Are size, weight and strength involved?

If we assume that screwworm flies evolved from blowflies, we can speculate on the behavioral changes that would be necessitated by the shift from a nonliving to a living larval substrate. Blowflies usually exhibit behavior that is extremely annoying to animals, but without disturbing their usual larval substrate. They noisily buzz about and mate on or in the vicinity of the substrate. A similar type of behavior would reduce the fitness of a fly whose substrate is a living animal. Screwworm flies seem to have evolved behavior patterns that reduce these disturbing aspects (1) They do not mate on the larval substrate; in fact, mature males rarely, if ever, visit animals. (2) The females do not buzz or fly disturbingly around wounded animals, but appear to be very unobtrusive during their approach to a wounded animal and while investigating an oviposition site.

Female screwworm flies visit wounds apparently to feed and to oviposite. Three day old females and gravid females (5-6 days old) are the most frequent among females visiting wounds. Females reach sexual maturity and usually mate when three days old. Thus, it seems that there has been a shift in location for mating from the larval substrate (blowflies) to an area in the vicinity, perhaps a certain distance downwind, in the evolution of the screwworms This provides a clue as to the locations where males may establish operating bases and where matings might be observed.

In view of the above considerations, a design encompassing nonphysical constraints of the flies could lead to a more informative test for the mate preferences of the various genetic types of this organism. The experimental design proposed by Wil Averhoff (February 15, 1979) is being

implemented in the Green Room at the Tuxtla plant, and lacks only the completion of the installation of added air conditioning capacity.

Agenda - Screwworm Meeting

December 11, 1979

La Quinta Motor Inn - McAllen, Texas

8:15	DE-9 Test in Mexico	Spencer
8:45	Aldama Test (what we learned)	Coppedge
9:00	Male Only Strain	Rawlins, McDonald
9:30	SWASS	SWASS Team
	Entomology	Coppedge
	Chemistry	Brown
10:00	SWASS in Mexico	Vargas
10:15	Break	
10:30	Tuxtla Research	Mackley
11:00	Tuxtla Methods	Martinez, Hofmann
11:30	Mission Methods	Wendel
12:00	LUNCH	Burger King Johnny's
	Genetics	
1:00	----- Morphology	Gagne, Ellison
1:30	----- Laboratory Crosses	Whitten
2:10	----- Sinaloa Genetics	McInnis
2:30	----- Arriaga Test	Univ. of Texas
3:00	Fargo Research	Fargo
3:30	Strain Development	Whitten
4:00	Pupal Shipment	Woodard
4:15	Surveys	Tannahill
4:30	Discussion	All
	DINNER	Pelican's Wharf

Dr. Richard - Entomologist - Douglas -

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

AGRICULTURAL RESEARCH
SOUTHERN REGION
Screwworm Research
P. O. Box 986
Mission, Texas 78572

November 9, 1979

Subject: Methods and Research Meeting

To: Nazario Piñeda and M. E. Meadows
Director and Co-Director
Comision Mexico-Americana Para
La Eradicacion del Gusano
Barrenador
Liebnitz No. 20 - 12° Piso
Mexico 1, D. F.

Again it appears to me that so many Research and Methods Development items need to be discussed during the next Quarterly Meeting that we should again consider a pre-meeting. Thus, I am proposing that we hold such a meeting on Tuesday, December 11, 1979, at the La Quinta Motor Inn. Attached is a proposed agenda of the items to be discussed. If others exist, please let me know as soon as possible. The following persons are suggested for attendance:

Drs. H. Padilla & R. Reichard-Mexico City
Mission Researchers
Tuxtla Researchers
Fargo Researchers
Dr. Ray Gagne-Washington, D. C.
Drs. A. Martinez y Tapia & C. Hofmann-Tuxtla Gutierrez
Dr. M. Vargas-Mexico City
Dr. F. Smith-Hyattsville
Mr. E. A. Taylor-Weslaco
Dr. D. A. Lindquist-Beltsville
Dr. L. E. Wendel-Mission
Dr. D. D. Wilson-Mission
Dr. R. Bello & Mr. B. Sudlow-Tuxtla Gutierrez
Mr. R. D. Richard-Douglas
Dr. Delvar Petersen-College Station
Univ. of Texas Researchers-Austin
Dr. J. Novy-Mission

If other persons should attend, please let me know. I do believe we should hold attendance to those who are specifically invited. Because of the wide and long itinerary, the

stated time limits will have to be maintained. The participants should plan on more than just a 'show & tell' and allow time for some open discussion. Everyone should plan on arriving in McAllen sometime during Monday so that we can begin promptly at 8:15 A.M. Please let me know your needs for transportation and lodging.

J. Wendell Snow
Research Leader

Distribution: see suggested attendance

Attachment: agenda

Agenda - Screwworm Meeting

December 11, 1979

La Quinta Motor Inn - McAllen, Texas

8:15	DE-9 Test in Mexico	Spencer
8:45	Aldama Test (what we learned)	Coppedge
9:00	Male Only Strain	Rawlins, McDonald
9:30	SWASS	SWASS Team
	Entomology	Coppedge
	Chemistry	Brown
10:00	SWASS in Mexico	Vargas
10:15	Break	
10:30	Tuxtla Research	Mackley
11:00	Tuxtla Methods	Martinez, Hofmann
11:30	Mission Methods	Wendel
12:00	LUNCH	Burger King Johnny's
	Genetics	
1:00	----- Morphology	Gagne, Ellison
1:30	----- Laboratory Crosses	Whitten
2:10	----- Sinaloa Genetics	McInnis
2:30	----- Arriaga Test	Univ. of Texas
3:00	Fargo Research	Fargo
3:30	Strain Development	Whitten
4:00	Pupal Shipment	Woodard
4:15	Surveys	Tannahill
4:30	Discussion	All
	DINNER	Pelican's Wharf

Dr Graham

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

RECEIVED
NOV 23 1979

AGRICULTURAL RESEARCH
SOUTHERN REGION
Screwworm Research
P. O. Box 986
Mission, Texas 78572

November 9, 1979

Subject: Methods and Research Meeting

To: Nazario Piñeda and M. E. Meadows
Director and Co-Director
Comision Mexico-Americana Para
La Eradicacion del Gusano
Barrenador
Liebnitz No. 20 - 12° Piso
Mexico 1, D. F.

Again it appears to me that so many Research and Methods Development items need to be discussed during the next Quarterly Meeting that we should again consider a pre-meeting. Thus, I am proposing that we hold such a meeting on Tuesday, December 11, 1979, at the La Quinta Motor Inn. Attached is a proposed agenda of the items to be discussed. If others exist, please let me know as soon as possible. The following persons are suggested for attendance:

Drs. H. Padilla & R. Reichard-Mexico City
Mission Researchers
Tuxtla Researchers
Fargo Researchers
Dr. Ray Gagne-Washington, D. C.
Drs. A. Martinez y Tapia & C. Hofmann-Tuxtla Gutierrez
Dr. M. Vargas-Mexico City
Dr. F. Smith-Hyattsville
Mr. E. A. Taylor-Weslaco
Dr. D. A. Lindquist-Beltsville
Dr. L. E. Wendel-Mission
Dr. D. D. Wilson-Mission
Dr. R. Bello & Mr. B. Sudlow-Tuxtla Gutierrez
Mr. R. D. Richard-Douglas
Dr. Delvar Petersen-College Station
Univ. of Texas Researchers-Austin
Dr. J. Novy-Mission

If other persons should attend, please let me know. I do believe we should hold attendance to those who are specifically invited. Because of the wide and long itinerary, the

stated time limits will have to be maintained. The participants should plan on more than just a 'show & tell' and allow time for some open discussion. Everyone should plan on arriving in McAllen sometime during Monday so that we can begin promptly at 8:15 A.M. Please let me know your needs for transportation and lodging.

J. Wendell Snow
Research Leader

Distribution: see suggested attendance

Attachment: agenda

Agenda - Screwworm Meeting

December 11, 1979

La Quinta Motor Inn - McAllen, Texas

8:15	DE-9 Test in Mexico	Spencer
8:45	Aldama Test (what we learned)	Coppedge
9:00	Male Only Strain	Rawlins, McDonald
9:30	SWASS	SWASS Team
	Entomology	Coppedge
	Chemistry	Brown
10:00	SWASS in Mexico	Vargas
10:15	Break	
10:30	Tuxtla Research	Mackley
11:00	Tuxtla Methods	Martinez, Hofmann
11:30	Mission Methods	Wendel
12:00	LUNCH	Burger King Johnny's
	Genetics	
1:00	----- Morphology	Gagne, Ellison
1:30	----- Laboratory Crosses	Whitten
2:10	----- Sinaloa Genetics	McInnis
2:30	----- Arriaga Test	Univ. of Texas
3:00	Fargo Research	Fargo
3:30	Strain Development	Whitten
4:00	Pupal Shipment	Woodard
4:15	Surveys	Tannahill
4:30	Discussion	All
	DINNER	Pelican's Wharf